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Study on Carbon and Oxygen Isotope Composition of the Calcites in Chahe Copper Deposit, Yuanjiang, Yunnan

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Chahe copper deposit, located at the Yuanjiang county, Yunnan province,is a copper dominated polymetallic mineral deposit. Calcite is one of the gangue minerals and its formation is closely with the metallic mineralization. The composition of carbon and oxygen isotope in the calcites is a very useful method to trace the source of relevant fluids (Zheng et al.,2000;Wu,2010). This paper aims to trace the source of mineralization fluid by the study on carbon and oxygen isotope composition of the calcites in copper deposit.

1 Geology of Deposit

Chahecopper deposit is situated in Dahongshan dome of the depression of the central Yunnan province, which is surrounded by Kanddian axis of earth, west of Yangtze paraplatform, northeast of Honghe deep-fault andLvzhijiang deep-fault striking south-north. The emergence stratums is a suit of mid-deep metamorphic volcanic sedimentary,whose age is lower proterozoic .The ore body is hosted in the second lithological section, which is shaped as layer, like-layer, lentoid. And the ore body is within the quartzite, mica-quart schist. The main ore minerals are chalcopyrite, pyrite, magnetite, pitchblende. The gangue minerals are quarts and calcites.

Silicification is prevalent and strong in the country rocks, there also have chloritization, carbonatation, micacization. Silicification occurs in the whole process of hydrothermal mineralization and the deep of Silicification is stronger than carbonatation in the wall rocks.

2 Composition of Carbon and Oxygen Isotope in the Calcites

Calcite is one of the gangue minerals in Chahe copper deposit, which occurs as veins, massed, sheet. According to the analytical results of trace elements, we divide the samples into calcites from two different sources. One,like sample C02-2, have the same origin with the country rocks, which have the same standarded pattern with the wall rock; the other, such as C02-1, C14 and C15, have the uniform standarded pattern, which absolutely differ from the standarded pattern of C02-2 and the country rocks.

The carbon and oxygen isotope compositions of the two periods of calcites in copper deposit, Chaheare listed in table 1. The calcites featured with high ^{18}O and low ^{13}C. The sample C02-1, C14 and C15 have limited variation of $\delta^{13}C_{V\text{-}PDB}$ and $\delta^{18}O_{SMOW}$ which is-0.96‰ ～ -3.00‰ (average -1.75‰), 8.00‰ ～ 8.89‰ (average 8.56‰) respectively. Sample C02-2, the same soured as the country rock, have higher and lower increasing range value of $\delta^{13}C_{V\text{-}PDB}$ and $\delta^{18}O_{SMOW}$, than sample C02-1, C14 and C15. $\delta^{13}C_{V\text{-}PDB}$ and $\delta^{18}O_{SMOW}$ of C02-2 is -0.84‰ and 8.96‰ separately.

The composition of carbon isotope is an effective method to judge the source of CO_2 in fluid. It is well known that the sources of carbon in mineralization fluid maybe mantle, sedimentary carbonate, organic carbon （Feng et al., 2011）.the composition of carbon isotope in calcites is close to the heterogeneous system of the mantle （Figure1）,but the composition of carbon isotope of the heterogeneous system of the mantle may affected by carbon from contamination of sedimentary rock and fractional carbon in high temperature, while the composition of oxygen is still. It is consistent with the analytical result of the composition of oxygen and carbon isotope(-0.84‰ -3.00‰). This indicate that the composition of oxygen and carbon isotope are from the heterogeneous system of the mantle may affected by carbon from contamination of sedimentary rock and fractional carbon in high temperature.

The carbon isotope composition of oceanic carbonate is 0±4‰（Veizer, Hoefs,1976; Hoefs, 1997）. The composition of carbon isotope in calcite in Chahe is -

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Table1 the composition of carbon and oxygen isotope in the calcites, Chahe Cu-deposit

Aample	Rock style	$\delta^{13}C_{V\text{-}PDB}$ (‰)	$\delta^{18}O_{V\text{-}PDB}$ (‰)	$\delta^{18}O_{SMOW}$ (‰)
C02-1	calcite	-1.29	-22.22	8.00
C02-2	calcite	-0.84	-21.29	8.96
C14	calcite	-3.00	-21.47	8.78
C15	calcite	-0.96	-21.36	8.89
Average	-1.52	-21.59	8.66	

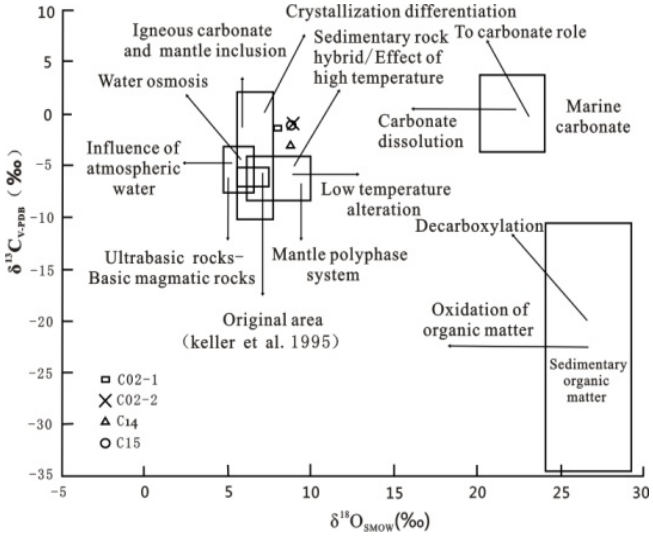

Fig.1 $\delta^{13}C_{V\text{-}PDB}$(‰)-$\delta^{18}O_{SMOW}$(‰) in the Chahe Cu-deposit (modified after Zhou et al., 2012)

0.84‰-3.00‰. This is same as the carbon isotope composition of oceanic carbonate.

However, the oxygen isotope composition of oceanic carbonate is lower than it affected by dissolution (Liu., 2004) .The composition of oxygen isotope in calcite in Chahe is 8.00‰～8.89‰. this imply that the source of carbon in calcite is oceanic carbonate impacted by dissolution.

3 Conclusion

Above all, based on the composition of carbon and oxygen of calcite in Chahecopper deposit, Yunnan, it concluded that the mineralization maybe the heterogeneous system of the mantle affected by contamination of sedimentary rock and fractionation in high temperature, then experienced dissolution of oceanic carbonate.

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References

Feng Caixia, Chi Guoxinag, Hu Ruizhong, Liu Yan, Liu Jiakun, Luo Taiyi, Qi Youqinag, . 2004 Feature of ore-forming fluid:ebidence from fluid inclusion, REE and carbon-oxygen isotope geochemistry of calcite from HuangjiawanMo-Nipolymentallic ore deposit, Zunyi, Guizhou Province, Acta.Petrilogica Sinica,27(12):3763-3776

Hoefs, J., 1997. Stable Isotope Geochemisty. Berlin: Springer, 65-168.

Liu Jiajun, He Mingqin, Li Zhiming, et al., 2004. Oxygen and carbon isotopic geochemistry of Baiyangping silver-copper polymetallic ore concentration area in Langping basin of Yunnan province and its significangce. Mineral Deposits,. 23 (1): 1-10 Veizer, J., Hoefs, J., 1976.The nature of $^{18}O/^{16}O$ and $^{13}C/^{12}C$ secular trends in sedimentary carbonate rocks. Geochim. Cosmochim. Acta, 40(11): 1387-1395.

Wu Kaixing,Hu Ruizhong,Bi Xianwu, Peng Jiantang. 2010 An oxygen and carbon isotope study on the formation mode of calcite in Beiya gold deposit, west Yunnan Province, China. Acta Mineralogica.Sinica, (4): 463-469

Zheng Yongfei, Chen Jiangfeng,. 2000 Stable Isotope Geochemisty. Beijing: Science Press.

Zhou Jiaxi, Huang Zhilong, Zhou Guofu, et al., 2012. C, O isotope and REE geochemistry of the hydrothermal calcites from the Tianqiao.Pb-Zn ore deposit in NW Guizhou Province, China. Geotectonica et Metallogenis, 36(1): 93-101.